

REMARKS

Claims 1-96 are pending in the application. Claims 1-96 are rejected. Claims 1, 28, 42, 55, 67, 74, 78, 83, 85, 86, 89 and 93 have been amended to clarify the present invention. No new matter has been added. Applicants respectfully request reconsideration of the rejections set forth in the Office Action dated April 7, 2004 in view of the preceding amendments and following remarks.

Amendments to the Specification

The paragraph added to the Specification is substantially identical to a paragraph in U.S. application 09/619,848, which was incorporated by reference in the present application on page 33 of the Specification on lines 16-20. The paragraph was added because it may possibly include essential matter.

Rejections Under 35 U.S.C. § 112

Claims 1-96 were rejected to under 35 U.S.C. 112, first paragraph, as containing subject matter the Office Action claims was not described in the Specification in such a way as to enable one skilled in the art to make and/or use the invention. Claims 1, 28, 42, 55, 67, 74, 78, 83, 85, 86, 89 and 93 have been amended to remove language that was previously objected to. Claim 96 did not include the cited language.

Claims 1, 28, 42, 55, 67, 74, 78, 83, 85, 86, 89 and 93 have been amended to clarify the present invention and now recite "wherein the polymer has an elastic modulus at most about 100 MPa". Support for this feature of the present invention is found in the Specification, as amended above, beginning on page 33, line 21, for example. Applicants also note that one of skill in the art is aware of the compliant nature of electroactive polymers related to the present invention. The claims have been amended to clarify this compliant nature with a structural limitation that is supported by the Specification, implicit to polymers described in the Specification, and known to those skilled in the art.

For at least these reasons, Applicants respectfully submit that all claims contain subject matter which was described in the Specification in such a way as to enable one

skilled in the art to make and/or use the invention, and respectfully request withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

Rejections Under 35 U.S.C. § 103

Claims 1-88 and 93-96 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Pottenger, Hubbard or Lee.

Claims 1, 28, 42, 55, 67, 74, 78, 83, 85, 86, 89 and 93 now recite "wherein the portion of the polymer has an elastic modulus below about 100 MPa". As mentioned above, this amendment reflects the compliant nature of polymers employed by the present invention.

Pottenger, Hubbard and Lee strictly employ piezoelectric materials. Piezoelectric materials are predominantly highly rigid materials in the GPa elastic modulus range. Pottenger, Hubbard and Lee do not teach or remotely suggest the use of a polymer as claimed. Hubbard and Lee describe the use of PVDF. Hubbard notably employs a PDVF having an elastic modulus of 2GPa (see Table 2), which is an order of magnitude (and double) greater than the range recited in the independent claims. Pottenger does not teach any material, let alone that recited in the claims. Lee uses rigid PVDF and plated nickel and aluminum electrodes (see col. 2, lines 32-34). Compliant electroactive polymers as claimed generally do not work with rigid plated nickel or aluminum electrodes since the solid electrodes rely on high stiffness in the piezoelectric, else they crack and fail. Thus, the references do not teach materials and devices as recited in the claims.

While adding plasticizer may lower the elastic modulus of some PVDF materials by a couple percent, it cannot lower the elastic modulus by an order of magnitude. In addition, as the PVDF softens, it loses its piezoelectric properties. Adding so much plasticizer to materials taught in the references would cripple their piezoelectric properties. Thus, if the devices in Hubbard or Lee were modified to a softer PDVF with a modulus less than 100 MPa, the devices would not operate because the material would fail to retain sufficient piezoelectric functionality. The art of record cannot be extended to soften their functional material to the point where softening destroys operability of their intended devices. Using a softer PVDF also goes against teachings in the references. For

example, the plated nickel and aluminum electrodes of Lee will crack and fail in the presence of a compliant electroactive polymer as claimed. Applicants also note that the references do not teach the use of a softener or compliant PVDF, do not teach any motivation for using any compliant PVDF or polymer as claimed, motivation for softening a PVDF material described, or a softener suitable for use with the particular PVDF materials described.

For at least these reasons, Pottenger, Hubbard or Lee, alone or in combination, do not teach or suggest the independent claims as now recited.

Claims 2-27, 29-41, 43-54, 55-66, 68-73, 75-77, 79-82, 84, 87-88, 90-92 and 94-96 each depend either directly from independent claims 1, 28, 42, 55, 67, 74, 78, 83, 85, 86, 89 and 93, respectively, and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to the independent claims. Further, the dependent claims recite additional elements which when taken in the context of the claimed invention further patentably distinguish the art of record. For example, dependent claim 26 recites "wherein the control electronics are further configured or designed to apply an electrical state that places the polymer in a stiffness regime that provides a desired stiffness for the device". As mentioned in the Specification on pages 29-31 for example, some polymers exhibit a characteristic stiffness in a regime, such as a characteristic linear or non-linear stiffness. FIG. 4E shows an exemplary stiffness relationship for a polymer with three separate stiffness regimes. Control electronics in electrical communication with the polymer control a polymer between the separate stiffness regimes. The prior art of record does not teach or remotely suggest stiffness regimes or operating in such regimes.

Withdrawal of the rejections under 35 USC 103(a) for Pottenger, Hubbard or Lee are therefore respectfully requested.

Claims 89-92 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Pottenger, Hubbard or Lee in view of Lazarus or Spangler.

The Examiner uses Lazarus and Spangler to teach an electroactive transducer in footwear. Both Lazarus and Spangler teach a piezoceramic material, which one of skill in the art recognizes to include an elastic modulus in the 20+ Gpa range (at least). Thus,

these references do not overcome the deficiencies described above with respect to Pottenger, Hubbard or Lee.

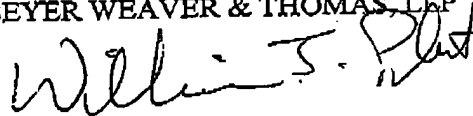
For at least these reasons, Pottenger, Hubbard, Lee, Lazarus or Spangler, alone or in combination, do not teach or suggest independent claim 92 as now recited. Withdrawal of the rejection under 35 USC 103(a) for Pottenger, Hubbard or Lee in view of Lazarus or Spangler is therefore respectfully requested.

Conclusion

Applicants believe that all pending claims are allowable and respectfully requests early Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,

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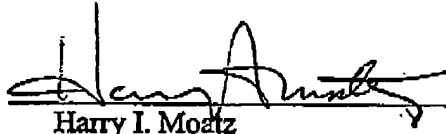
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Expires: April 21, 2005



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